1-2015

AHRC 231.01: Respiratory Critical Care

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The University of Montana – Missoula College
Respiratory Care Program

COURSE NUMBER AND TITLE: ***AHRC 231T Respiratory Critical Care***

DATE REVISED: Spring 2015 **SEMESTER CREDITS: 4**

CONTACT HOURS: 4 lecture hours per week, **T, 12:30-2:30,** & **F, 10:00 – 12:00**, (Variable throughout semester) HB16

PREREQUISITE: RES 101T, 129T, 130T, 131T, 235T, 150T

FACULTY:
Nick Arthur
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243-7836 (office)
Office: GH 04
Office Hours: By Appointment

RELATIONSHIP TO PROGRAM:
This class introduces the student to hospital critical care, with emphasis on ventilator care and management. This prepares the student for clinical use of mechanical ventilation as life support.

COURSE DESCRIPTION: Physiology, indication, contraindications, and application of mechanical ventilation. Emphasis on patient assessment, monitoring, stabilization and weaning during assisted pressure breathing. Analysis of the various modes of ventilation, including optimal patient-ventilator interface in the adult. Special setting and home mechanical ventilation will also be covered.

STUDENT PERFORMANCE OUTCOMES: At the completion of this course the student will be able to identify indications for and modes of mechanical ventilation and their appropriate use. The student will gain proficiencies in advanced airway and ventilator management, patient monitoring, Modification of therapy, and weaning from mechanical ventilation. Additionally, students will become familiar with transport and special settings for mechanical ventilation. The student is introduced to ACLS principles.

METHODS OF INSTRUCTION: Lecture, reference reading, and group discussion.

STUDENT ASSESSMENT METHODS AND GRADING PROCEDURES: There will be four major exams and a number of quiz/worksheets during the course. *Specific dates of exams will depend upon our progress through the course material and will be announced well in advance.* Exam content will be as follows:

Exam 1: ***Units I & IIa***
Exam 2: ***Unit IIb, IIc, III***
Exam 3: ***Unit IV***
Exam 4: ***Unit V***

Unit Exams: 80%
Quizzes: 15%
Participation: 5%
***Approximate* breakdown**

GRADING SCALE:

A =	4.0	95-100%	C =	2.00	74-76%
A- =	3.67	90-95%	C- =	1.67	70-73%
B+ =	3.33	87-89%	D+ =	1.33	67-69%
B =	3.00	84-86%	D =	1.00	64-66%
B- =	2.67	80-83%	D- =	.067	60-63%
C+ =	2.33	77-79%	F =	0.00	

Students in the Respiratory Care Program must have a "B-" (80% or greater) final grade in order to progress within the program. Test questions will be based on unit objectives. Unit objectives are to be used as study guides.

METHODS TO IMPROVE COURSE:
Student evaluations and respiratory faculty assessment of course content.

ATTENDANCE: Class attendance is an integral part of this course. Exam dates will be announced. Only legitimate reasons for missing an announced exam will be accepted. Failure to appear for scheduled exams will result in 15% point deduction. Expect periodic unannounced quizzes. There is no make-up for missed quizzes. SEE: TEST/QUIZ MAKEUP

OTHER POLICIES:

ACADEMIC INTEGRITY:
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by The University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://life.umt.edu/vpsa/student_conduct.php .

DISABILITY ACCOMODATION:
Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely way. Please speak with me after class or in my office. Please be prepared to provide a letter from your DSS Coordinator. For more information, visit the Disabilities Services website at http://www.umt.edu/dss/ or call 406-243-2243 (voice/text)
Note: Instructor reserves the right to modify syllabi and assignments as needed based on faculty, student, and/or environmental circumstances.

Cell Phones/Pagers: Due to an increasing number of students, who own and use cell phones and pagers, it has become necessary to institute a policy during class times. As you are aware, these tools are distracting to an entire class. However, some students require them for business, which allows them to further their education. Please follow these guidelines:

If the cell phone/pager in not business or emergency related, please turn it off.
Use the vibrating option on your pager.
Do not listen to the messages in class. Please leave class quietly.
CELL PHONES AND PAGERS MUST BE TURNED OFF DURING EXAM AND CLASS PRESENTATIONS.

SEATING: Many classrooms have chairs to accommodate persons with disabilities. These chairs will display the international disability symbol and are assigned to a particular student. Please refrain from using these chairs or making adjustments to them unless the chair is assigned to you. If you think you may have the need for a specific chair, please contact Disability Student Services. Thank you for your cooperation.

TEST/QUIZ MAKEUP: Make-up exams and lab experiences will only be given under extreme circumstances and then only if: a) permission is granted ***in advance*** by the course instructor, or b) a written excuse is provided by a medical doctor. The burden of proof is on the student, so you must document and prove a justifiable absence. Not following this procedure prior to the exam will automatically result in a 15% point reduction of the subsequently taken exam. Missed tests need to be made up within ***one week*** of the original date given. You are responsible for contacting the Academic Support Center, 243-7826, to schedule the make-up. Failure to do so will result in a ***ZERO*** grade for the missed test.

The faculty senate guidelines concerning the issuance of incomplete grades will be followed. Attention to critical dates such as P/NP, drop, etc. is the responsibility of the student. Students wishing to drop the class after the drop deadline will need a documented justifiable reason for doing so. Dropping the class for fear of bad grade or to protect a GPA are **not** justifiable reasons. The principles embodied in the **Student Handbook Code** will be adhered to in this course.

***Quizzes**: Failure to be present for quizzes will result in a zero being recorded and used in computing your average. There will be no make-up opportunities for missed quizzes.

Homework: It is the expectation that homework will be turned in when due. If you are not present, it is your responsibility to see that it is in my mailbox by 4:00 p.m. on the due date or a zero will be recorded and used in computing your average.

REQUIRED TEXTS:

Title: Egan's Fundamentals of Respiratory Care, 9th edition
Author: Wilkins, et al
Publisher: Mosby

Title: Clinical Application of Mechanical Ventilation, 3rd edition. **(OPTIONAL)**
Author: Chang
Publisher: Delmar ISBN: 978-1-4018-8485-7

Title: Basic Clinical Lab Competencies for Respiratory Care, 4th edition.
Author: White
Publisher: Delmar

Unit outlines, objective, Clinical Practice Guidelines, readings and check offs.

UNIT I: A. Advanced Airway Management

Outline:

I. Introduction
- A. Indications
- B. Anatomy of the Upper Airway
- C. Airway Reflexes

II. Endotracheal Tubes
- A. Anatomy
  - i. Characteristics
  - ii. Murphy Eye
  - iii. Cuffs
  - iv. Pilot Tube and Balloon
  - v. Markings
- B. Oral vs. Nasal

III. Specialized Endotracheal Tubes
- A. Double Lumen Tubes
  - i. Indications
  - ii. Selection
  - iii. Insertion
  - iv. Risk Factors
- B. Hi-Low Evac Tubes

IV. Oral tracheal Intubation
- A. Equipment
- B. Tube Size
- C. Tube Position
- D. Tube Stabilization

V. Nasotracheal Intubation
- A. Direct Visualization
- B. Blind Passage

VI. Indications, Advantages, and Disadvantages of Tracheal Airway Routes

VII. Trouble shoot blocked ETT and tracheostomy tube conditions.

VIII. Rapid Sequence Intubation
- A. Indications/ Contraindications
- B. Techniques

IX. Endotracheal Suction
- A. Equipment and Procedure

B. Minimizing Complications, hazards, and Adverse Reactions

X. Nasotracheal Suctioning
A. Equipment and Procedure
B. Minimizing Complications, hazards, and Adverse Reactions

XI. Sputum Sampling
A. Lukens Sputum Trap

XII. Airway Trauma Associated with Endotracheal Tubes
A. Laryngeal Lesions
B. Tracheal Lesions
C. Preventions
D. Cuff Care

XIII. Airway Maintenance
A. Adequate Humidification
B. Minimizing Nosocomial Infections
C. Secretion Clearance
D. Minimizing Likelihood of Aspiration

XIV. Extubation
A. Assessing Patient Readiness

XV. Management of Difficult/Failed Airway

Objectives: At the end of this unit the student will be able to:

1. Describe the airway reflexes discussed in class.
2. Describe the construction of an endotracheal tube.
3. Describe the technique for oral tracheal and nasotracheal intubation.
4. Describe and discuss specific uses of specialized endotracheal tubes discussed in class.
5. List advantages and disadvantages of both tracheal airway routes.
6. Define rapid sequence intubation, discuss indications and contraindications.
7. Describe the techniques and timing of rapid sequence intubation
8. Demonstrate the technique used to secure an endotracheal tube.
9. Demonstrate the technique used to measure cuff pressure.
10. Compare conventional and closed suction catheters.
11. Describe techniques used to prevent complications from suctioning.
12. Discuss the important points of extubation and decannulation.
13. Identify at least three ways to confirm that an endotracheal tube lies in the trachea.
14. List the equipment necessary to perform invasive ventilation (transtracheal or surgical airway) and describe a procedure for airway entry.
15. List the complications related to invasive airway access and the treatment of each.
16. Review the equipment and steps for obtaining sputum samples via artificial airways.
17. Identify risks to patients with artificial airways and strategies to limit these risks.
18. Describe emergencies relative to ETT placement and troubleshooting methods.

Clinical Practice Guidelines:

Refer to AARC Clinical Practice Guidelines at: www.rcjournal.com.online_resources & follow the link under Clinical Practice Guidelines.

Refer to the following guidelines

1. Management of Airway Emergencies
2. Resuscitation and Defibrillation in the Health Care Setting
3. Nasotracheal Suctioning
4. Endotracheal Suctioning of Mechanically Ventilated Patients with Artificial Airways
5. Removal of the Endotracheal tube

Reading:

White, Chapters 20 and 21

Egan's Fundamentals of Respiratory Care, Ch. 33
Chang, Ch.5 & 6

Check offs (Either White's Basic Lab Competencies Text, or the RES 250 Syllabus)
Intubation – RES 250 Syllabus
Extubation p. 413
Nasotracheal Suctioning p. 435
Endotracheal Suctioning p. 437
Monitoring Cuff Pressure p. 439

UNIT I: B. Tracheostomy Tubes and Management

Outline:

I. Tracheostomy
   - A. Advantages
   - B. Disadvantages
   - C. Tube Sizes
   - D. Special Tubes

II. Tracheotomy
   - A. Surgical Procedure
   - B. Percutaneous Dilation Tracheostomy
   - C. Emergency Procedure (Cricothyroidotomy)

III. Providing for Communication
   - A. Talking Trach Tube
   - B. Fenestrated Trach Tube
   - C. Passy – Muir Valve

IV. Tracheostomy Care
V. Changing the Tracheostomy Tube
VI. Troubleshooting Tracheotomy Emergencies
VII. Tracheotomy Decannulation
   - A. Tube Removal
   - B. Fenestrated Trach Tubes
   - C. Progressively Smaller Tubes
   - D. Tracheal Buttons

Objectives: At the end of this unit the student will be able to:

1. Discuss advantages and disadvantages of tracheostomy
2. List indications for tracheostomy.
3. Compare conventional and percutaneous dilatational tracheostomy.
4. Compare various designs of tracheostomy tubes.
5. List the complications related to invasive airway access and the treatment of each.
6. Describe three ways to wean patients from tracheostomy tubes. Include extra long trach tube.
7. List three methods to allow patients with tracheostomy tubes to speak.
8. Identify the airway risks facing tracheal patients and identify strategies and equipment for the prevention of each.
9. List the steps involved in trach care.
10. List the steps involved in changing a trach.

Reading: (same as unit 1A)

Lab Check offs: (Per White's Basic Lab Competencies text):
Tracheostomy and Stoma Care p. 441

UNIT II: Procedures Related to Mechanical Ventilation

II: A. Chest Tube Drainage

Outline:

A. Indications for Chest Tube
B. Chest Tube Selection and Placement
C. Methods of Placement
D. Chest Tube Drainage System
E. Care and Removal of Chest Tube
F. Transport with Chest Tube

Objectives: Upon completion of this unit the student will be able to:

1. Discuss the anatomy, physiology and pathophysiology of the thorax as it applies to the chest tubes.
2. Describe the procedure for a thoracentesis.
3. Describe emergency chest drainage systems.
4. Identify and describe components of one, two, three bottle chest drainage systems and the Pleur-Evac system.
5. Identify clinical parameter that should be assessed for the patient with chest tubes.
6. Discuss actions to prevent infections in patient with chest tubes.
7. Identify patient needs during and after chest tube removal.
8. State the indications for placement and the purpose of chest tubes.
9. Differentiate between a chest drain and a chest tube.
10. Describe why a chest tube might be placed anteriorly or posteriorly in the thoracic cavity.
11. Describe the consequences of the presence of too much or too little water in the water seal chamber.
12. Describe the consequences of the presence of too much or too little water in the suction control chamber.
13. Describe how to assess whether the vacuum source is correctly regulated.
14. Describe how to assess the chest drainage system for leaks and how to correct them.

Readings:
White's Basic Lab Competencies, Chapter 22, Chest Tubes
Egan's Fundamentals, Ch. 25, Pleural Diseases
Chang, Ch.14

Audio-Visual (in class): Chest Drainage, Springhouse VHS series, **# 617.9SPR**,

Lab Check Offs: Chest Tube Monitoring – RES 250 Syllabus

II. B. Transportation of Mechanically Ventilated Patients

Outline:
A. Indications
B. Contraindications
C. Equipment and Supplies
D. Types of Transport
E. Procedure for Inter hospital Transport
F. Hazards and Complications
G. Magnetic Resonance Imaging

Objectives: Upon completion of this unit the student will be able to:

1. List indications for transporting mechanically ventilated patients.
2. List contraindications for patient transport.
3. Discuss different types of patient transport.
4. Describe the procedures for inter-hospital transport.

Clinical Practice Guidelines: www.rcjournal.com.online_resources

In-hospital Transport of the Mechanically Ventilated Patient, 2002 revision and update.
No competency check-offs at this time.

II. C. Non Invasive Positive Pressure Ventilation

Outline:
Noninvasive Ventilation Techniques
Negative Pressure Ventilation

Positive Pressure Ventilation
Goals and Indications
Acute and Chronic settings
Patient Selection
Equipment Selection:
Types of devices and Interfaces
Initiation of Therapy
Monitoring and Modification of therapy
Weaning and Discontinuation of Therapy

Objectives: In addition to objectives for Chapter 45, Egan's Fundamentals, at the end of this unit the student will be able to:

1. Define Noninvasive Ventilation and discuss various techniques
2. Discuss clinical benefits of NIV
3. Identify appropriate patient selection criteria for NIV
4. Compare and describe Equipment and Pt. interfaces utilized to provide NIV
5. Describe advantages/disadvantages/risks associated with various Pt. interfaces.
6. List steps involved in initiation of NPV.
7. Describe assessment of Pt. receiving NIV and make recommendations to modify therapy based on Pt. clinical assessment data and observations.
8. Recognize complications associated with NIV therapy and suggest solutions
9. Identify causes of CO_2 rebreathing during NPPV
10. Describe when arterial line placement is indicated.
11. Discuss critical aspects of A-Line management & sampling.
12. Describe approaches to weaning a Pt. from NPPV.
13. Determine when it is time to provide ventilatory support.

Clinical Practice Guidelines: www.rcjournal.com.online_resources

Non Invasive Ventilation
Arterial Line Sampling

Readings: Ch. 10 – White's Basic Clinical Lab Competencies: Non-Invasive Monitoring
Chang, Ch.7 – NIV and Ch. 14 -Transport

Audio Visuals: Arterial Line Management

Lab Check Offs: (Either in White's Basic Lab Competencies text or RES 250 Syllabus as indicated):
BiPAP Vision & Respironics V60 – RES 250 Syllabus,
Non-Invasive Positive Pressure Ventilation, p. 511

UNIT III: Mechanical Ventilation

Outline:

A. Mechanical Ventilators
B. Physiology of Ventilatory Support

Objectives: At the end of these units the student will be able to:

1. Discuss how ventilators work: Inputs & Outputs, including key terms.
2. Understand and describe various types of Mechanical Ventilators (Pneumatic, Fluidic, Negative Pressure)
3. Identify phase variables of the Breath cycle
4. Differentiate between Spontaneous and Mandatory breaths
5. Describe key modes of MV, including key terms and clinical applications.
6. Identify potential sources of injury to the lungs resulting from positive pressure ventilation
7. Describe pressure gradients relative to MV
8. Describe effects of MV on oxygenation, ventilation, lung mechanics, cardiovascular system, hemodynamics, and general physiology.
9. Discuss positive pressure ventilation settings.
10. Identify waveforms used to describe & monitor MV.
11. Discuss complications of MV

Readings: handouts, articles, videos, instructor lecture.
Chang, Ch1 (review/refresher), Ch.2, 3, 4

Mandatory COT Computer Lab Home Work:

Interactive computer based tutorial for the PB 840 mechanical ventilator *AND* interactive computer based tutorial for Viasys Avea mechanical ventilator.

A post-test for each is to be printed out and turned in on the FIRST DAY of the FIRST ventilator lab week.

UNIT IV: Initiate, Monitor, & Manage Critical Care Ventilation

Outline:

A. Initiating & Adjusting Ventilatory Support
B. Monitoring & Management of the Patient in ICU, including basic waveforms and pharmacology.

Objectives: At the end of these units the student will be able to:

1. Discuss the principles of Pt. selection for MV.
2. Describe conditions requiring MV and key terms associated.
3. Discuss bedside monitoring during MV and key terms.
4. Discuss strategies to improve ventilation, oxygenation, and acid-base status during MV.
5. Describe basic MV management strategies for normal and diseased lung conditions, plus key terms in text.
6. Discuss the concept of waveform analysis and key terms in text.
7. Describe the effects on waveforms in various ventilation modes & conditions.
8. Discuss MV troubleshooting by waveform analysis.
9. Discuss the role of Pharmacology in MV management and key terms.
10. Discuss troubleshooting of common MV alarms and events.
11. Describe care of the MV circuit and artificial airways
12. Discuss issues of fluid and electrolyte balance, nutrition and adjunctive MV management strategies.
13. Describe strategies to modify MV based upon Pt. assessment data and observations including use and implications of ABG's, Hemodynamic, and Capnographic data ($ETCO_2$)
14. Describe Arterial Line Sampling & Management

Clinical Practice Guidelines: www.rcjournal.com.online_resources
Patient Ventilator system Checks
Ventilator Circuit Changes
Care of the Ventilator Circuit and Its Relation to Ventilator-Associated Pneumonia

Humidification during Mechanical Ventilation
Selection of Devise, Administration of Bronchodilator, and Evaluation of Response to Therapy in Mechanically Ventilated Patients
Static Lung Volumes
Selection of Aerosol Delivery Devise

Readings: Handouts, videos, journal articles, and lecture.
Chang, 8 through 12.

Lab Check Offs: (Either in White's Basic Lab Competencies text or RES 250 Syllabus as indicated):

Initiation of Continuous Mechanical Ventilation, p. 575
Monitoring Continuous Mechanical Ventilations, p. 557
Changing a Ventilator Circuit, in RES 250 syllabus
Waveform (graphics) Monitoring, RES 250 Syllabus
End Tidal Monitoring, p. 179 & Arterial Line Sampling, p. 141
Puritan 840 Ventilator Competency (lab only), in RES 250 syllabus,
Viasys Avea Ventilator Competency (lab only), in RES 250 syllabus

UNIT V: Discontinuation of Mechanical Ventilation & Ventilators in the Home

Outline:

A. Discontinuing Ventilatory Support
B. Home MV

Objectives: At the end of these units the student will be able to:

1. Discuss weaning strategies relative to disease processes and patient conditions, plus key terms in text.
2. Define weaning success.
3. Describe basic weaning criteria.
4. Identify weaning indices and protocols.
5. Describe causes and conditions of weaning failure.
6. Discuss terminal weaning.
7. Describe goals of home MV and key terms.
8. Identify patient populations appropriate for MV.
9. Describe equipment and education considerations for home MV.

Clinical Practice Guidelines: www.rcjournal.com.onlin_resources

Weaning & Discontinuing Ventilatory Support
Long-Term Invasive Mechanical Ventilation in the Home
Suctioning of the Patient in the Home

Readings: Handouts, journal articles, videos, instructor lecture. Guest Lectures
Chang, Ch.15, 16, 18

Lab Check Offs: Ventilator Waveform interpretation, Clt & Raw - RES 250 Syllabus
Spontaneous Ventilation Parameters, P. 625

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